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*Published in:*  
Dansk Ornitologisk Forenings Tidsskrift (DOFT)

*Publication date:*  
2011

*Document version*  
Publisher's PDF, also known as Version of record

*Citation for published version (APA):*  
Pedersen, P. E., Petersen, T. L., Jørgensen, P. S., & Tøttrup, A. P. (2011). The breeding population of Red-backed Shrike *Lanius collurio* in Gribskov, Denmark. *Dansk Ornitologisk Forenings Tidsskrift (DOFT)*, 105(3), 179-182.

# Mindre meddelelser

## The breeding population of Red-backed Shrike *Lanius collurio* in Gribskov, Denmark

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Global change is affecting timing of spring arrival (Tøttrup et al. 2006), breeding initiation time (Both et al. 2004, Both & te Marvelde 2007), onset of migration and en route migration phenology (Tøttrup et al. 2008) as well as sub-Saharan wintering conditions (e.g. Saino et al. 2007) for Danish populations of long-distance migrants. Meanwhile, population declines in long-distance passerines are being reported from both sides of the Atlantic Ocean (Rappole 1995, Lloyd-Evans & Atwood 2004, Sanderson et al. 2006, Heldbjerg & Fox 2008). For species in decline and under threat from changing environmental conditions, basic knowledge on breeding biology and population status is important for securing optimal conservation initiatives (Greenwood 2007).

The Red-backed Shrike *Lanius collurio* is a long-distance trans-Saharan migrant (Cramp & Perrins 1993). Throughout north-western Europe studies and monitoring programmes are reporting this species to be in decline (Tucker & Heath 1994, Hagemeyer & Blair 1997, BirdLife International 2004). On the British Isles, Red-backed Shrike has gone extinct, and the Dutch population declined from several thousand breeding pairs to a few hundred in the 20th century, only remaining at a few strongholds (Geertsma et al. 2000). The decline in the Netherlands is thought mainly to be caused by loss of suitable habitat linked to anthropogenic eutrophication and agricultural intensification (Esselink et al. 1995). This may also apply as the main mechanism behind the population declines in other Western European countries (Tucker & Heath 1994, Golawski & Meissner 2008, Söderström & Karlsson 2011).

The Danish population of Red-backed Shrike has gone through a historical decline since the mid 20th century (Grell 1998), and some sites which held large populations have now been almost totally abandoned (Frølich 2007). The national population was considered to be stable between the two nationwide breeding bird surveys (1973-76 and 1993-

1996), at 1500-3000 breeding pairs (Grell 1998). However, based on other data sources a decline since the 1970s has recently been reported (point count data: Heldbjerg & Fox 2008).

Gribskov in northern Zealand is one of the largest forested areas in Denmark (5600 ha). It is a mixed forest with Red-backed Shrikes found breeding in temporary forest clearings as well as naturally occurring heathlands and meadows with grazing or hay-cutting within the forest. The breeding population was reported to hold approx. 35 breeding pairs during 1993-96 (Grell 1998). The Red-backed Shrike is included in Annex 1 of the EC Birds Directive, implying that Denmark is legally bound to ensure a favourable conservation status for the species and its breeding sites (EU 2009). The present study gives estimates of the population size, breeding success, and breeding phenology for Red-backed Shrikes in Gribskov. Because of ongoing environmental changes and population declines, we investigate how local weather affects breeding success in this forest-living population of Red-backed Shrike.

### Methods

The population of Red-backed Shrike in Gribskov was assessed by mapping breeding pairs throughout the breeding season during seven years (2004-2010). All known and potential breeding sites within the forest were visited at least three times during the breeding season, with visits temporarily spread out to cover both early summer and time of fledging. Each visit would last at least 30 minutes. Efficiency of the field-work has gradually increased during the study period owing to investigators' increasing skill in locating the species and to increasingly more focused search and mapping procedures. In the present report we include the minimum number of breeding pairs mapped each year as well as the number of fledglings per breeding pair during five years (2006-

2010) obtained by observing the family flocks in the breeding territories after fledging. The potential impact of summer weather conditions on breeding success was tested by use of two indicators of environmental conditions during the breeding time: mean July temperature (°C) at Hillerød near Gribskov, and July precipitation (mm) in northern Zealand. In 2009 and 2010, searches for nests were conducted and brood size recorded as number of nestlings at age 3–10 days. Furthermore, nest position (height above ground) and nest tree species were noted. Finally, as a measure of breeding initiation time we estimated hatching dates on the basis of nestling age. Weather data were provided from the Danish Meteorological Institute (DMI) (monthly reports at <http://www.dmi.dk>). All statistical tests were performed using SAS 9.1 (SAS Institute Inc., Cary, NC).

Results

The mean number of breeding pairs found each year in Gribskov was 97 ( $n = 7$ ; see Table 1). However, there was a clear increasing trend in the numbers during the study period ( $r^2 = 0.81$ ,  $P = 0.002$ ), most likely caused by an improved coverage (see Methods). During the last four years of the period, the mean number of breeding pairs was 114, with no trend over time ( $r^2 = 0.29$ ,  $P = 0.46$ ). The highest number was 132 pairs in 2009.

In total, 264 breeding pairs were included in the assessment of breeding success as measured by the number of fledglings (Table 1). The overall mean number of fledglings for the 264 broods was 3.40 ( $SD = 0.82$ ), with annual means varying between 2.80 and 3.91. The inter-annual variation was statistically significant (ANOVA,  $F = 20.4$ ,  $df = 4$ ,  $P < 0.0001$ ).

Table 1. Population estimate (minimum number of breeding pairs determined by territory mapping), and mean number of fledglings per successful pair, of Red-backed Shrikes in Gribskov, North Zealand, during 2004–2010. *Ynglebestanden af Rødrygget Tornskade (ynnglepar) i Gribskov 2004–2010, samt det gennemsnitlige antal udføjne unge fra produktive reder.*

Year	Population estimate	No. of fledglings mean $\pm$ SD (n)
2004	63	-
2005	77	-
2006	84	3.79 $\pm$ 0.61 (42)
2007	109	2.80 $\pm$ 0.70 (51)
2008	97	3.31 $\pm$ 0.72 (54)
2009	132	3.91 $\pm$ 0.73 (64)
2010	118	3.15 $\pm$ 0.80 (53)

In the southern part of Gribskov, where coverage was best and effort most uniform through the years, the results were similar (mean = 3.42 and  $SD = 0.86$ ; annual means varying between 2.7 and 4.0).

The annual mean number of fledglings (as a measure of breeding success) was positively correlated with the mean July temperature ( $r = 0.53$ ,  $n = 5$  years,  $P = 0.35$ ; Fig. 1A) and negatively correlated with July precipitation ( $r = -0.76$ ,  $N = 5$  years,  $P = 0.13$ , Fig. 1B), suggesting that weather does influence breeding success. However, none of these tendencies was statistically significant.

Nests were placed at a mean height of 141 cm ( $SD = 80$  cm,  $n = 71$ ). They were found in 12 different plant species and in heaps of logging waste. Most were in common spruce *Picea abies* (mean height

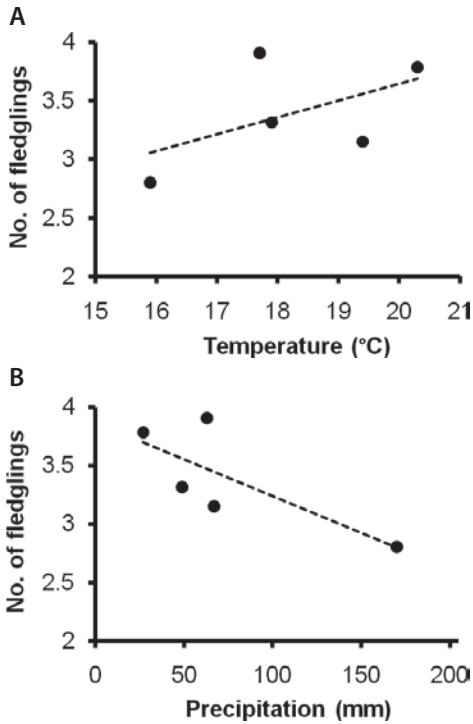


Fig. 1. Mean number of fledglings (successful breeding pairs only) against (A) mean July temperature (°C) at Hillerød near Gribskov ( $r = 0.53$ ,  $N = 5$  years,  $P = 0.35$ ), and (B) July precipitation (mm) in northern Zealand ( $r = -0.76$ ,  $N = 5$  years,  $P = 0.13$ ). *Det gennemsnitlige antal udføjne unge fra produktive par i årene 2006–2010, plottet mod A) middeltemperaturen i juli (Hillerød), og B) nedbøren i juli (nordlige Sjælland). Regressionslinjerne stiger hhv. falder, som forventet, men ingen af regressionerne er statistisk signifikante (hhv.  $P = 0.35$  og  $P = 0.13$ ).*

= 138 cm, SD = 72, n = 19), beech *Fagus sylvatica* (162 cm, SD = 72, n = 13), and hawthorn *Crataegus monogyna* (154 cm, SD = 91, n = 12). The highest-placed nest was found in a beech 350 cm above ground, and the lowest in a heap of logging waste at a height of 15 cm.

The first Red-backed Shrikes arrive in Gribskov in mid-May, with a main influx towards the end of May (P.E. Pedersen unpubl. data). The earliest recorded hatch dates have been 12 June in 2009 and 13 June in 2010. The mean number of nestlings per brood has been 5.38 (SD = 0.86, N = 21, range: 4-7). These results are in agreement with previously reported figures from similar localities (Cramp & Perrins 1993).

## Discussion

The population of Red-backed Shrike in Gribskov was found to number as many as 132 breeding pairs (2009), or 4-9 % of the total breeding population in Denmark (according to the population estimate by Grell 1998). The number of breeding pairs found increased during the first years, most likely due to the increasing search time and a generally improving efficiency in locating the breeding birds. With a late spring arrival and an elusive behaviour at certain stages of the breeding period, we believe that a proportion of the breeding pairs will remain undetected when potential breeding sites are visited one or two times only. The total number in Gribskov found in our study is much higher than the number reported during the Atlas Project in the 1990s (33-35 pairs; Grell 1998). On basis of our current knowledge and field experience from Gribskov, we suggest that previous population estimates were significantly affected by an insufficient coverage, and that reliable population estimates for the species require dedicated efforts and targeted monitoring.

We regard our estimates of number of fledglings from successful breeding pairs as minimum figures because of the difficulty in finding all fledglings by visual observation. However, we applied the same field method throughout the study, and all field-work was conducted by the same person (PEP). Our results suggest that variation in breeding success could partly be caused by weather conditions, with warm and dry summers resulting in higher reproductive success. This result agrees with findings by P.S. Jørgensen et al. (in prep.).

The IPCC (2007) predicts overall warmer and drier summer conditions in north-western Europe in future climate scenarios (van der Linden & Mitchell

2009). This could potentially improve breeding conditions for Red-backed Shrike in Denmark. However, the climate scenarios also predict more variable weather conditions and more intense precipitation events (more rain within shorter time periods), with an unknown effect on breeding performance in long-distance migrants. Late-arriving migrants have limited time for breeding, and Red-backed Shrike may be particularly vulnerable to heavy precipitation, placing its open cup nest in exposed habitats (Cramp & Perrins 1993).

Increasing our knowledge of the effect of climate change on breeding performance should include the collecting of data from more habitats and geographical areas (e.g. Greenwood 2007). Range shifts and changes in regional species composition are expected under the future climatic changes (Huntley et al. 2007). Hence, future conservation initiatives are relying on basic knowledge of life history parameters and continued monitoring especially of Annex I species (EU 2009).

## Acknowledgements

We thank Naturstyrelsen and in particular Hans Holbech as well as Dansk Ornitologisk Forening – BirdLife Denmark and the Caretaker Project. Steffen Brøgger-Jensen, Bo Kayser and Kaj Kampp are thanked for valuable comments improving the manuscript. All authors are grateful to the Danish National Research Foundation for supporting Center for Macroecology, Evolution and Climate.

## Resumé: Ynglebestanden af Rødrygget Tornskade i Gribskov

I perioden 2004 til 2010 er ynglebestanden af Rødrygget Tornskade i Gribskov i Nordsjælland blevet monitoreret ved kortlægning af ynglepar, registrering af kuldstørrelse, ynglesucces og redeplacering. Ynglebestanden tæller op til 132 ynglepar (2009), hvilket svarer til 4-9 % af den samlede danske ynglebestand. Det gennemsnitlige antal flyvefærdige unger per succesfuldt par var 3,40. Dette mål for ynglesucces udviste en ikke-signifikant positiv korrelation med juli-temperaturen, og en ligeledes ikke-signifikant negativ korrelation med nedbøren; der kunne altså ikke demonstreres en sammenhæng, men retningen af den antydede effekt antyder, at der faktisk er en sammenhæng, men at det vil kræve et noget større materiale eller en længere tidsserie at eftervise den. Endvidere fandt vi, at Rødrygget Tornskade kan placere reden i mindst 12 forskellige træarter og også i kvasbunker. De mest almindelige redetræer var bøg og rødgran. I gennemsnit var redeerne placeret 141 cm over jorden, med den laveste i 15 cm (kvasbunke) og den højeste i 350 cm højde (bøg). I 2009 og 2010 klækkede æggene i de tidligste kuld hhv. 12. og 13. juni, og den gennemsnitlige kuldstørrelse var 5,38 redeunger.

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